Annals of Clinical and Analytical Medicine
Original Research

Obstetric outcomes of ureteral catheterization during pregnancy, our clinical experience

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Abstract

Aim: Hydronephrosis is a common condition in pregnancy, especially on the right side. Probable causes are ureteral stones and the physiological state of pregnancy. Conservative treatments are preferred unless the flank pain persists and becomes intractable, or if additional complications, including recurrent resistant urinary tract infections, persist or deterioration of the renal function occurs. In this study, we aimed to determine obstetric outcomes of ureteral catheterization during pregnancy.

Material and Methods: The data of patients who had ureteral catheterization during pregnancy due to intractable flank pain and hydronephrosis between June 2018-July 2020, were collected from the hospital data system. Pregnant women with singleton pregnancies with intractable flank pain and hydronephrosis who were treated with double J stent (DJS) were included in this study. Mean or median values were used for descriptive analysis of the characteristics of data for the normal distribution. Categorical data were given as percentages. Chi-square and Fisher Exact tests were used for categorical data.

Results: Thirty-six pregnant women had ureteral catheterization (DJS) during pregnancy at various gestational ages. The mean age of women was 24.82± 3.78 (20-34) years. Eight out of 36 pregnant women were primigravid. The mean gestational age at DJS insertion time was 23.14 ± 5.68 (12-36) gestational weeks. In our study, among hydronephrosis patients, the normal rate of vaginal birth was significantly higher than the cesarean rate (p:0.03). There was no significant difference between the side of hydronephrosis according to the type of birth (p>0.05) There was no significant difference between the sides of hydronephrosis according to urinary tract infections (p>0.05).

Discussion: DJS treatment can be chosen without anxiety of premature birth.

Keywords

Hydronephrosis; Double Stent Insertion; Ureteral Stone; Urinary Tract Infection

DOI: 10.4328/ACAM.20621 Received: 2021-04-03 Accepted: 2021-07-10 Published Online: 2021-07-29 Printed: 2021-09-15 Ann Clin Anal Med 2021;12(Suppl 4): S419-422
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Introduction

Several changes occur in the urinary system during pregnancy. There are also significant changes in the urinary system anatomy, as well as functional changes. The renal calyces and ureters dilate in more than 80% of pregnancies by mid-gestation and increase in size as the pregnancy progresses. Dilatation is more common on the right side than on the left [1]. The predisposition of physiologic dilatation on the right side is caused by compression on the right ureter from the dextrorotated uterus. Also, the left ureter is protected from compression by a gas-filled sigmoid colon [1]. Clinically, these changes result in an increased risk of ascending urinary tract infections and urinary system calculi due to urinary stasis. Also, sonographic difficulties occur when differentiating real pathological conditions from physiologic changes like hydronephrosis [2].

Although hydronephrosis is a common condition and may be severe with advancing gestation, it has a poor correlation with maternal symptoms. Flank pain is not associated with the degree of hydronephrosis during pregnancy. Furthermore, physiological changes in the urinary tract during pregnancy may not only predispose the patient to urolithiasis formation, but may also pose a diagnostic challenge. Although physiologic hydronephrosis of pregnancy is usually asymptomatic, it may cause flank pain lateralizing to the affected kidney. Conservative treatments are preferred unless the flank pain persists and becomes intractable, or additional complications, including recurrent resistant urinary tract infections, persist, or deterioration of the renal function occurs [2, 3].

Urolithiasis is the other frequent cause of flank pain in pregnancy. The incidence of symptomatic urinary calculi does not change in pregnancy, and the incidence has been reported as 1/244 to 1/3300 and is similar to that in non-pregnant women of the same age [4]. Urolithiasis symptoms frequently occur in the second and third trimesters. The association of symptomatic urolithiasis with preterm labor and spontaneous rupture of membranes has been reported in several studies. This association seems to be significant [5]; 70-80% of symptomatic calculi passage spontaneously and do not necessitate any surgical intervention [6].

Ureteral catheterization and percutaneous nephrostomy are preferred management methods for symptomatic urolithiasis and intractable flank pain in pregnancy. However, it is a controversial issue whether to treat or not, due to the risk of adverse effects of surgery and stent on pregnancy. In this study, we aimed to determine obstetric outcomes of ureteral catheterization during pregnancy.

Material and Methods

This is a retrospective study. The data of patients who underwent ureteral catheterization during pregnancy due to intractable flank pain and hydronephrosis between June 2018-July 2020 were collected from the hospital data system. Gestational ages of pregnancies were described according to the last menstrual period date and were verified by first trimester ultrasonographic fetal biometric measurements.

Before the surgical procedure, urinary ultrasonography (USG) was performed for the diagnosis and grading of hydronephrosis. The hydronephrosis grading was made according to the grading system of the Society of Fetal Ultrasound (SFU) [7]. According to this grading system, there is no hydronephrosis (HN) at grade 0. At grade 1, only the renal pelvis is visualized, HN grade 2 is present when a few but not all calices are identified in addition to the renal pelvis. HN grade 3 requires that virtually all calices are seen. HN grade 4 may have a similar appearance of the calices as grade 3, but the involved kidney has parenchymal thinning compared to the normal side.

Pregnant women with singleton pregnancies with intractable flank pain and hydronephrosis who were treated with double J stent (DJS) were included in this study. Pregnant women who had recurrent DJS insertion in the same pregnancy, twin pregnancies, patients with a history of recurrent preterm birth, patients who had DJS, but gave birth due to other indications were excluded. Preterm birth was defined as birth of a baby before 37 weeks of gestation

Pregnant women who had hydronephrosis with intractable flank pain underwent double J stent (DJS) ureteral catheterization treatment. Intractable pain was evaluated using the Visual Analog Scale (VAS) (no pain: 0–4 mm, mild pain: 5–44 mm, moderate pain: 45–74 mm, and severe pain: 75– 100 mm) [8].

Surgical procedure: Informed, written consent was obtained before the procedure. Sterile urine was provided by all patients before the surgery. DJS implementation was performed in lithotomy position under spinal anesthesia. An 8.5/10.5 Fr ureteroscope was introduced into the ureteral orifice. A sensor PTFE-Nitinol Guidewire was passed through the ureteroscope into the renal collecting system and a 6 Fr DJS was placed by sliding over the sensor. After making sure that the DJS was in the renal collecting system with USG peroperatively, surgical procedure was completed.

All pregnant women were followed up until birth after the surgical procedure. Ages of patients, gravidity, parity, gestational age at DJS insertion, symptoms before DJS, gestational age at birth, indication of birth, side of hydronephrosis, presence of urinary stone, presence of urinary infection, laboratory findings at DJS insertion, presence of pregnancy complications, neonatal outcome were evaluated.

Written informed consent for participation in the study was obtained from all the patients, and the study was conducted in accordance with the Declaration of Helsinki.

Ethical approval was taken from Harran University Faculty of Medicine Medical Research Studies Ethics Committee (HRU/20.18.01).

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS.22, IBM SPSS Statistics for Windows, Version 22.0, IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test were used to verify the normality of distribution. Mean or median values were used for descriptive analysis of the characteristics of the data for normal distribution. Categorical data were given as percentages. Chi-square and Fisher Exact tests were used for categorical data. T-test was used for calculating 2 independent means, for all tests, significance level was defined as $p < 0.05$.

Results

Thirty-six pregnant women underwent ureteral catheterization (DJS) during pregnancy at various gestational ages between June 2018 and July 2020. The ,ean age of women was 24.82± 3.78 (20-34) years. Eight out of 36 pregnant women were primigravid.

Indications for surgical intervention were ureteral stones in 5 patients, symptomatic hydronephrosis in 31 patients due to the physiological state of pregnancy. A total of 34 patients had grade 3 hydronephrosis, only 2 patients had grade 4 hydronephrosis. The hydronephrosis side among pregnant women who had surgical intervention was predominantly right-sided ($p<0.05$). Four patients (11%) had hydronephrosis on the left side, 32 patients (89%) had onthe right side, but the side of hydronephrosis according to gravidity was not significant.

The mean gestational age at DJS insertion time was 23.14 ± 5.68 (12-36) gestational weeks. DJS of all patients were withdrawn postpartum. Eleven patients (30.6 %) had a cesarean section, 25 patients had vaginal delivery (69.4%). Thirteen (36.1%) patients, had urinary system infection during pregnancy. The mean gestational age at birth was 36.5±2.65 (29-40) gestational weeks. None of the patients had a history of DJS insertion at previous pregnancy. The mean interval time between DJS and birth was 13.23±5.95 (1-24) gestational weeks.

Table 1. Results according to side of hydronephrosis

	Total group (n=36)	Left side (n=4)	Right side (n=32)	p
Age(years)	24.82± 3.78	23.5±4.04	25±3.78	NS
Gravidity	3.4±1.80	3±2.30	3.38±1.82	NS
Gestational age at ureteral catheterization(weeks)	23.14 ±5.68 (12-36)	20.25±5.25	23.16±6.06	NS
Hydronephrosis grade	Grade 3: 34	4	30	NS
	Grade 4: 2	0	2	
Presence of ureteral stone	5	1	4	NS
Normal vaginal birth	25	3	22	NS
Cesarean section	11	1	10	
Gestational age at birth	36.5±2.65	35±4	36.8±2.49	NS
<37 weeks	12	1	11	
37-39 weeks	19	3	16	NS
>39 weeks	4	0	4	
Presence of UTI*	13	1	12	NS
Interval time between DJS and birth	13.23±5.95	14.75±9.21	13.03±5.69	NS
VAS score** (mm)	9.2±0.62	8.75±0.5	9.26±0.63	NS

*Urinary tract infection, **Visual analog score, NS: not significant ($p>0.05$)
Values are given as number or mean ± standard deviation (range).

Discussion

Hydronephrosis is a common condition during pregnancy due to mechanical factors and hormonal changes with the increased circulating estrogen, progestational hormones and prostaglandin-like agents [9]. Hydronephrosis is common, especially in the second and third trimesters. The fact that ureteral dilatation is more frequent starting from the 2nd trimester and progresses faster supports the theory that the ureters are put under pressure by the pregnant uterus.

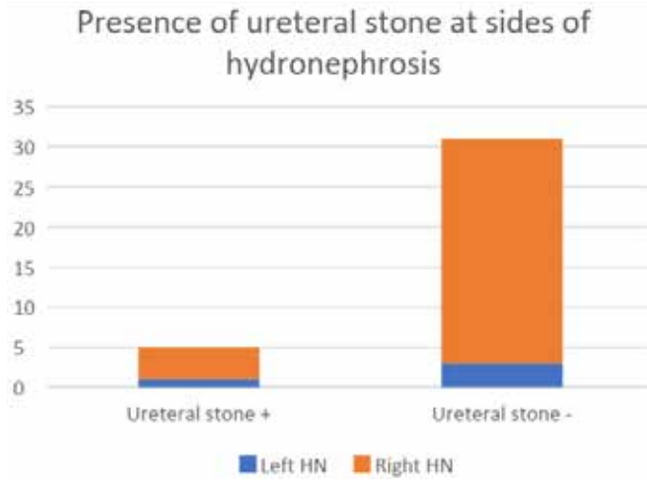

Figure 1. Presence of ureteral stone on the sides of hydronephrosis (HN: hydronephrosis).

Five (13%) patients had ureteral stones. In 1of 4 left-sided ureteral dilatation, the ureteral stone was found. Comparison of the ureteral stone with the side of hydronephrosis was not statistically significant. The p-value is .495521.

In our study, the mean gestational age of DJS inserting time was 23.14 ± 5.68 (12-36) gestational weeks. There was no statistically significant difference between gravidity and side of hydronephrosis according to DJS inserting time ($p>0.05$). Hydronephrosis of only 2 patients out of 36 was determined in the first trimester (12th week). One of these was primigravid, and one was multigravid patients.

Dilatations up to Grade II in the right kidney are considered normal and usually do not require any intervention [10]. In our study, 34 patients had grade 3 hydronephrosis, only 2 patients had grade 4 hydronephrosis. There was no statistically significant difference between the side of hydronephrosis according to the grade of hydronephrosis($p>0.05$).

In our study, we included DJS inserted patients due to intractable flank pain. The mean VAS score in our patients was 9.2±0.62. This score was at the level, describing severe pain (75– 100 mm). There was no statistically significant difference between the groups according to the side of hydronephrosis($p>0.05$).

Dilatation is seen 3 times more in the right kidney than in the left. One of the reasons why dilatation is seen more on the right side is that the sigmoid colon on the left side relatively protects the left ureter from compression. Since the right ureter crosses the iliac vessels more proximally, pressure and tension are higher in the right ureter. In addition, the dextrorotation of the growing uterus in the midtrimester is also an important factor [11, 12]. In our study, 4 patients (11%) had hydronephrosis on the left side, 32 patients (89%) had on the right side. There was no significant difference between the number of patients according to the side of hydronephrosis.

In the literature, in cases of left ureteral dilatation, ureteral stones are more common [13]. In our study, only one of the total 4 left-sided ureteral dilatations was associated with ureteral stone ($p>0.05$). Although Stothers et al reported that urinary stones are more common in multipar women [14], there was no statistically significant difference between primi/multigravid patients according to the presence of the ureteral stone ($p>0.05$) in our study. There was also no significant relationship

between the ureteral stone and side of hydronephrosis (p>0.05). Eleven patients (30.6 %) had a cesarean section, 25 patients had vaginal delivery (69.4%). In our study, among hydronephrosis patients, normal vaginal birth rate was significantly more than the cesarean rate (p:0.03). There was no cesarean section in primigravid group. In our hospital, we encourage vaginal delivery, unless emerging situations and the necessity for cesarean occur during labor but there was no significant difference according to the side of hydronephrosis (p>0.05).

The mean gestational age at birth was 36.5±2.65 (29-40) gestational weeks. We categorized patients as preterm birth (<37 weeks), no preterm birth (≥37 weeks); 12 (33%) patients had preterm birth; there was no significant difference between the side of hydronephrosis (p>0.05). There was no significant difference between the sides of hydronephrosis according to urinary tract infections (p>0.05). The mean interval time between DJS inserting time and birth was 13.23±5.95 gestational weeks. There was no significant difference between the sides of hydronephrosis according to the interval time between DJS inserting time and birth (p>0.05).

Although a study by Faundes et al found that hydronephrosis was seen in primigravid [9], in our study, the number of multigravid patients was more than primigravid (p>0.05). The mean gravidity was 3.4±1.80 pregnancies.

Our study has some limitations. We included only patients who underwent DJS insertion due to hydronephrosis with intractable flank pain, a limited number of 36 patients. Our indication was restricted to only this indication. The strength of our study was that our hospital is a single-center for the diagnosis and treatment of pregnant patients with hydronephrosis. Thus, we can easily follow up our patients. Although hydronephrosis patients had intractable flank pain, preterm birth and cesarean rates did not increase.

Conclusion:

Although hydronephrosis is a common condition in pregnancy, only a small part of patients need invasive treatment, and invasive treatment can be chosen without anxiety of premature birth.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Funding: *None*

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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How to cite this article:

Alev Esercan, Emre Ekmekci, Tuncer Bahceci. Obstetric outcomes of ureteral catheterization during pregnancy, our clinical experience. Ann Clin Anal Med 2021;12(Suppl 4): S419-422